Table of Contents

E82 Complete Vehicle

Initial Print Date: 1/08 Revision Date: 4/08

Complete Vehicle

Model: E82

Production: 3/2008

OBJECTIVES

After completion of this module you will be able to:

- Describe the similarities between the E82 and the E9X vehicles
- Describe the construction of the body-shell of the E82
- Identify the features offered in the E82

Introduction

Inspired by past 2002 models of the sixties and seventies BMW has designed a vehicle combining rear-wheel-drive, excellent handling and powerful engines with the stiffest and lightest bodyshell possible along with accommodations for four. The 1 Series Coupe is sure to pick up where the 2002 left off.

For those of us that where lucky enough to ever drive the legendary BMW 2002, the 1 Series inspires feelings of nostalgia. With the innovations in automotive technology and safety along with the experience gathered over the many years of vehicle development, one can only imagine the car that BMW would build today in honor of such automotive legacy.

BMW 2002

Efficient Dynamic concepts come to life in the 1 Series with the use of light but rigid body construction and a sleek aerodynamic underbody. Dynamic Stability Control and Dynamic Traction Control have been developed even further for this car to ensure that advanced management systems deliver maximum power with exceptional handling.

There is no doubt that with this 1 Series, BMW succeeded in recreating the look, feel and performance of the sport sedan with a race car soul, for new drivers to experience and for enthusiasts to enjoy once again.

The E82 1 Series Coupe

The E82 is being launched in Spring of 2008. The models available are the 128i and 135i. The main difference between the E92 and E82 is in the area of the side sills or rockers panels. The doors, roof and luggage compartment also differ from the E82, with noticeable changes in the floor assembly and in the vehicle interior. The front and rear bumpers have been newly designed for this vehicle.

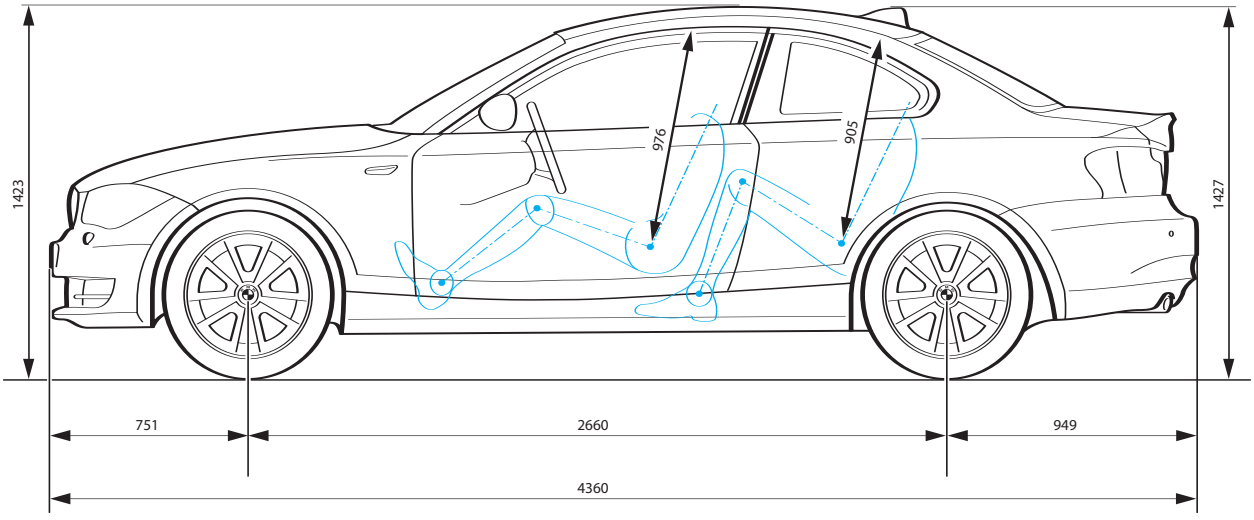
The 128i will be powered by an N51 Sulev engine or the N52, 230 horsepower inline 6-cylinder 3.0-liter engine that generates 200 lb-ft of torque, the 128i Coupe will feature Valvetronic, VANOS and aluminum/magnesium block construction.

The 135i Coupe features the N54 twin-turbocharged direct injection 3.0-liter inline six-cylinder engine, that produces 300 horsepower and an incredible 300 lb-ft of torque from as low as 1,400 rpm.

Conforming to BMW's Efficient Dynamics, these vehicles will include the following:

- Light weight but rigid bodyshell.
- Aluminum front axle with lightweight components like hollow anti-roll bars.
- Run Flat Tires as standard equipment.

Exterior Dimensions

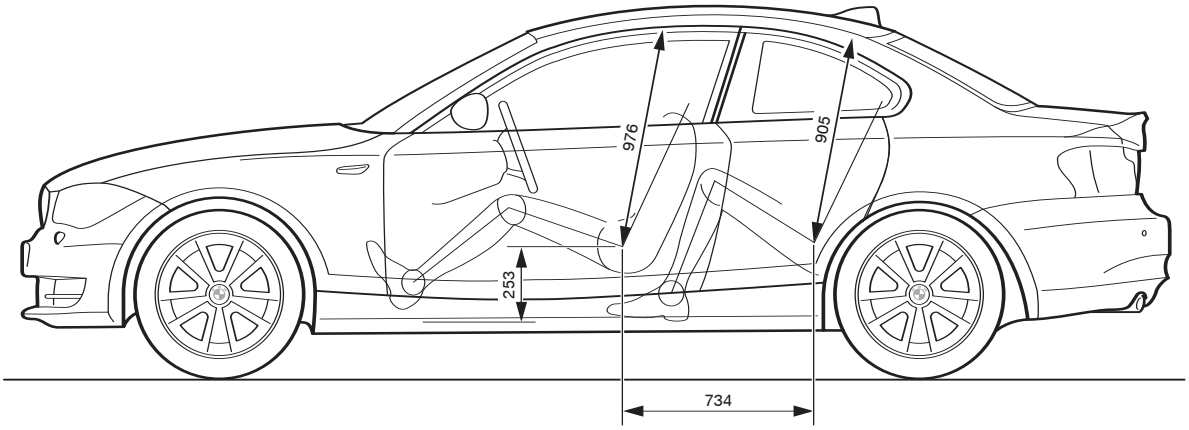


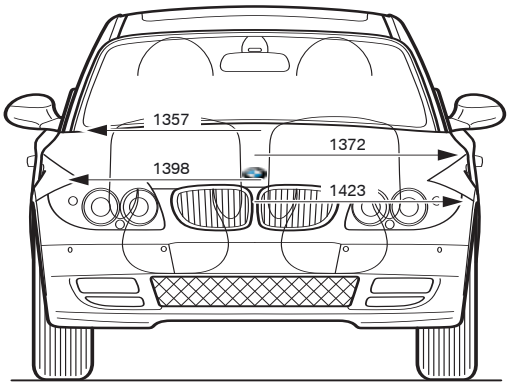
In comparison to the E92, the E82 is taller.

The E82 compared with the current E92:

External dimensions (mm)	E82	E92
Vehicle length	4360	4580
Overall vehicle width	1748	1782
Vehicle height, unladen	1423	1395
Wheelbase	2660	2760
Overhang front	751	771
Overhang rear	949	1049
Track width front	1486	1500
Track width rear	1532 (135i)	1513

Interior Dimensions





Note: A convertible version of the 1 Series, the E88, is also available.

Body

The E82 features an intelligent mix of components.

The front body work was inspired by the E9x design and re designed to complement the E82 styling. The doors were adopted from the European 1 Series. The luggage compartment is somewhat shorter than that of the E92. The main differences are to be found in the side view and silhouette of the vehicles.

All of the steel grades used in this vehicle were featured in the E90 with the aim on achieving comparable crash results. In addition, the E82 body offers a high level of passive safety protection.

Aerodynamics

Aerodynamics in combination with 50/50 weight distribution and a rigid body construction, contributes to outstanding driving characteristics and effective dynamics. The aerodynamic styling is complemented by various design components. These include the front spoiler edge, very smooth underbody pan with specially designed cooling ducts molded into the bodywork.

E82 Underbody Pan (front bumper and spoiler view)

Additionally, the underbody allows a defined flow of air to be directed to components subjected to greater thermal load with the use of spoiler edges and ram-air ducts.

E82 Front Brake Cooling

Passive Safety

The basics for the E82's bodyshell passive safety are:

- High load-bearing carrier body reinforcements
- Optimum utilization of deformation zones
- Extremely rigid passenger compartment.

The protection of occupants even in the most severe of accidents places high demands on the structure of the passenger compartment and on the deformation zones at the front and rear sections of the vehicle.

All external loads acting on the vehicle are absorbed by specially designed load-bearing reinforcements in the floor assembly, side frame, bulkhead, roof and on luggage compartment partition.

The body structure of the E82 offers occupants maximum safety while optimizing vehicle weight. The use of high tensile strength steel in large panels complemented by well calculated reinforcements results in a light but rigid and strong bodyshell.

In the event of a strong frontal collision, optimum dissipation of forces is achieved by means of precisely calculated and tested load paths which absorb and distribute the force of impact onto several of the body components.

The main focus is the development of an optimum balance between front-end deformation and passenger compartment rigidity, minimizing the forces to the vehicle occupants.

Ideally, in severe collisions this load distribution can channel forces towards the side opposite the impact, protecting the bulkhead area and the footwell through dynamic deformation zones at the front. The energy absorption characteristics form the basis for maintaining the passenger compartment structure and the prerequisite for the successful adaptation of restraint systems by means of a correspondingly low passenger compartment deceleration.

In addition, an impact-optimized footrest is fitted. In the event of a frontal collision, the footrest deforms in the area between the driver's foot and the bodyshell. This significantly reduces how much force is transmitted to the driver's foot.

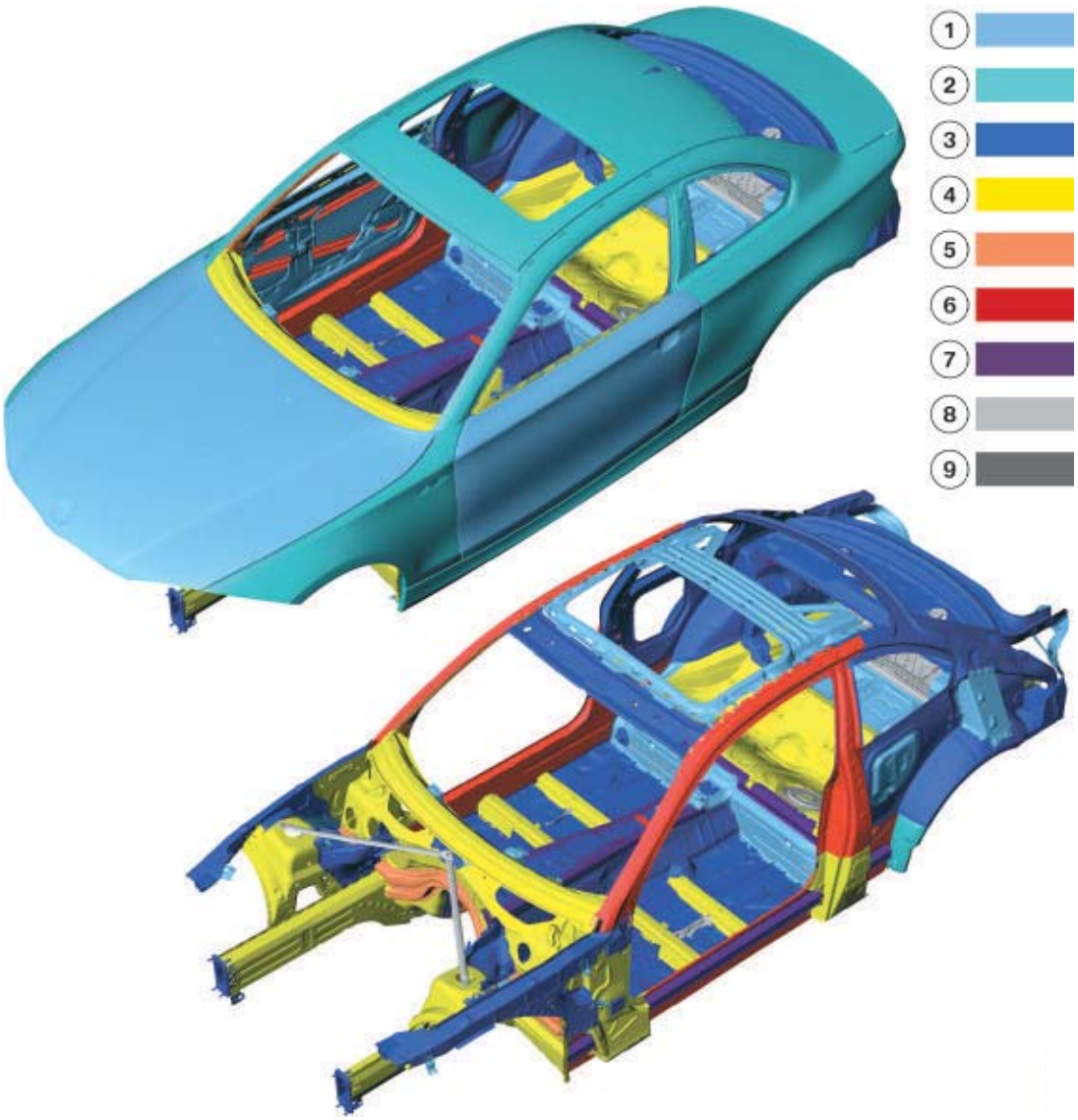
There are three additional design elements:

- Specially arranged floor components cause impact forces to be transmitted to the side of the vehicle opposite the impact.
- The doors themselves, a reinforced B-pillar, the seats and the instrument panel between the A-pillars provide the stability and side structure in combination with the roof frame.
- The rear deformation zone is made up of two longitudinal sections, the luggage compartment floor, rear trim panel, the quarter panels integrated in the side frame and various reinforcements.

Here too, the primary objective is to maintain the protection of the passenger compartment so that even in the event of an offset impacts the doors can still be opened afterwards.

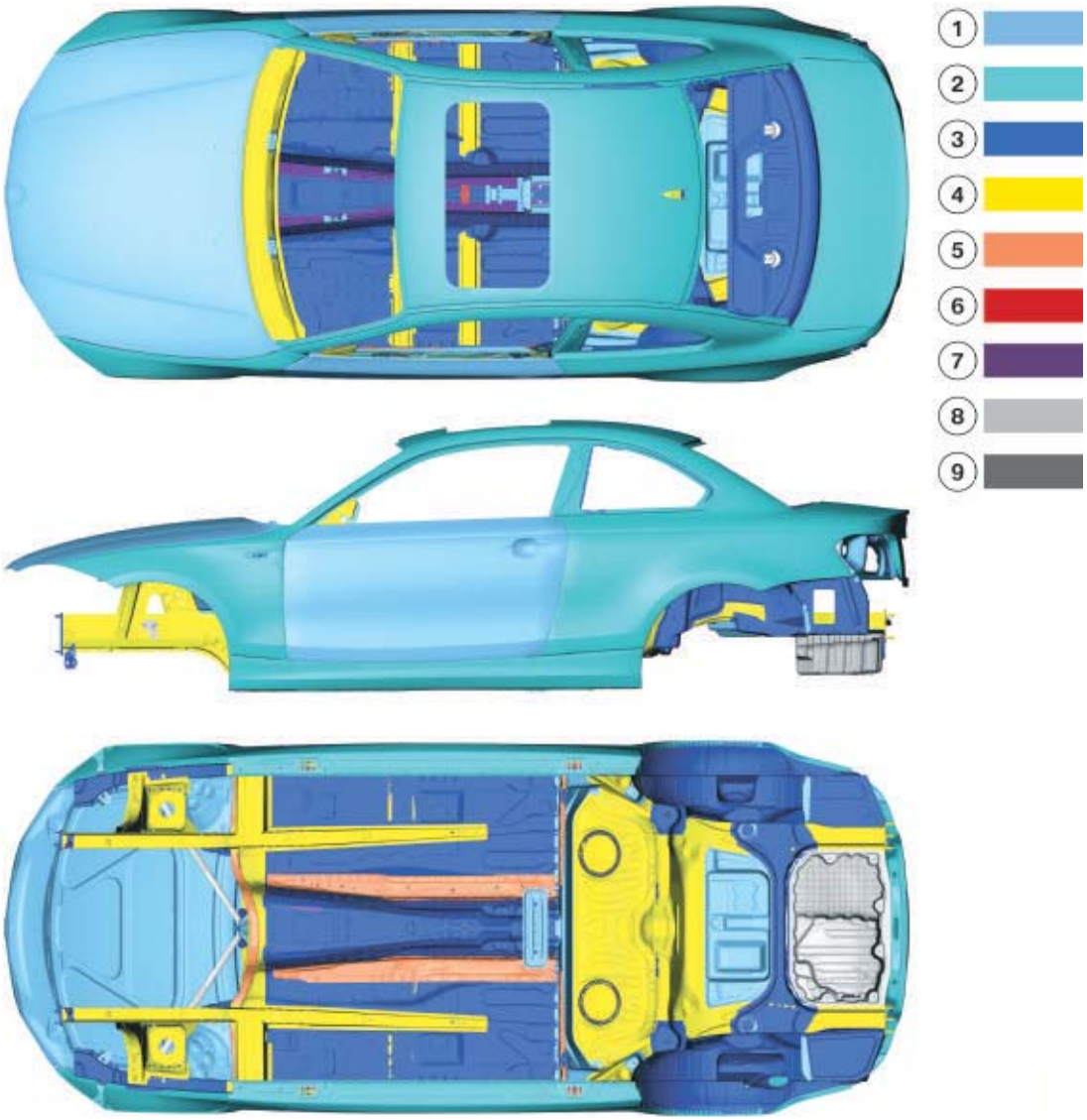
Even if the vehicle overturns, the passenger compartment safeguards the occupant space thanks to the heavily reinforced pillars and cross members.

Bodyshell Construction



Index	Explanation	Index	Explanation
1	HC180BD, HC180YD, HX180BD	6	H400T, HC400TD, HC420LAD
2	DC01, DC04, DX54D, DX56D	7	HC600C, HD680C
3	HC220BD, HC220YD, HX220BD	8	Plastics
4	HC300BD, HC306LAD, HC300XD	9	Other metal materials
5	HC380LAD		

Bodyshell Components



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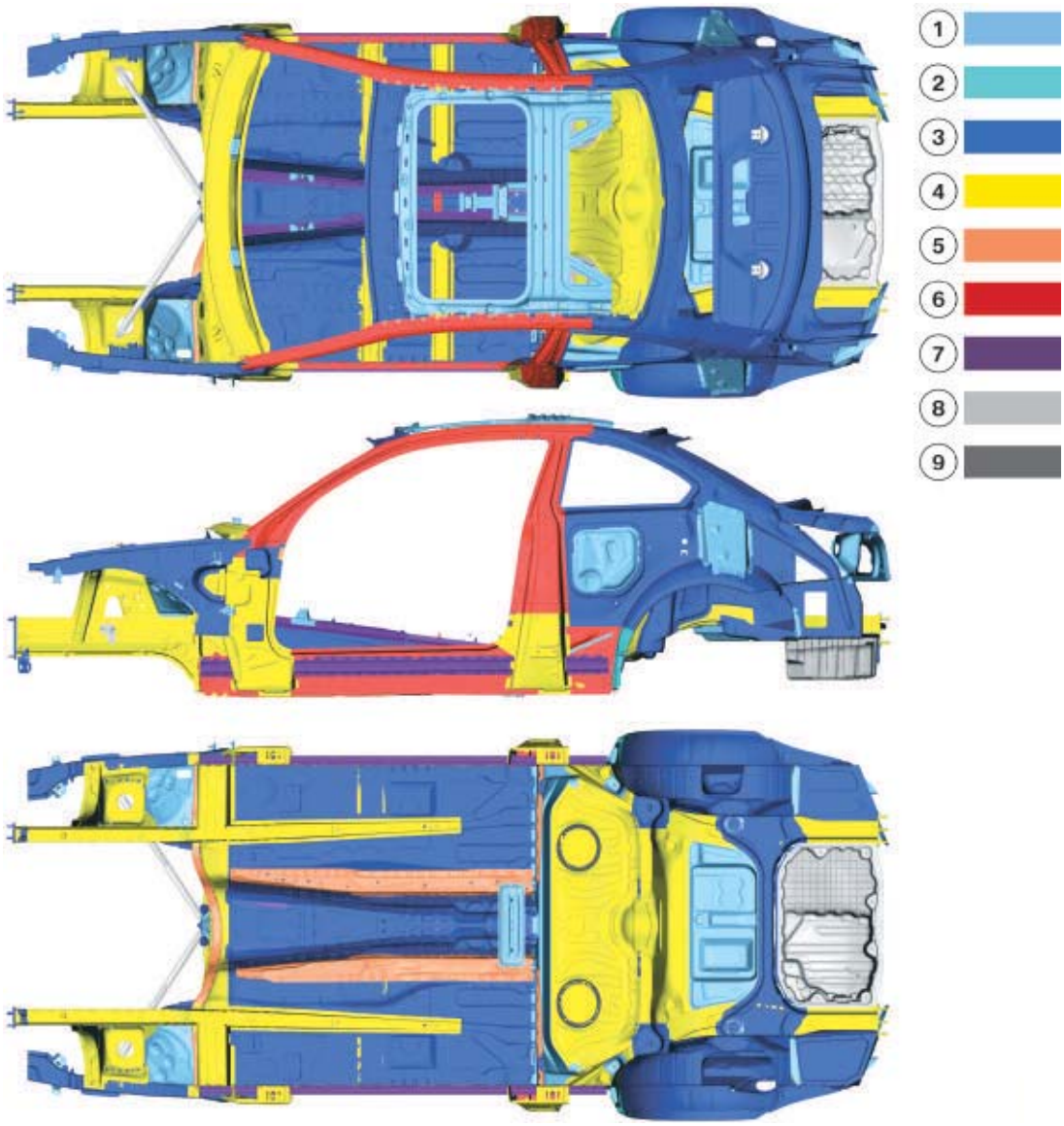
Bodyshell Components



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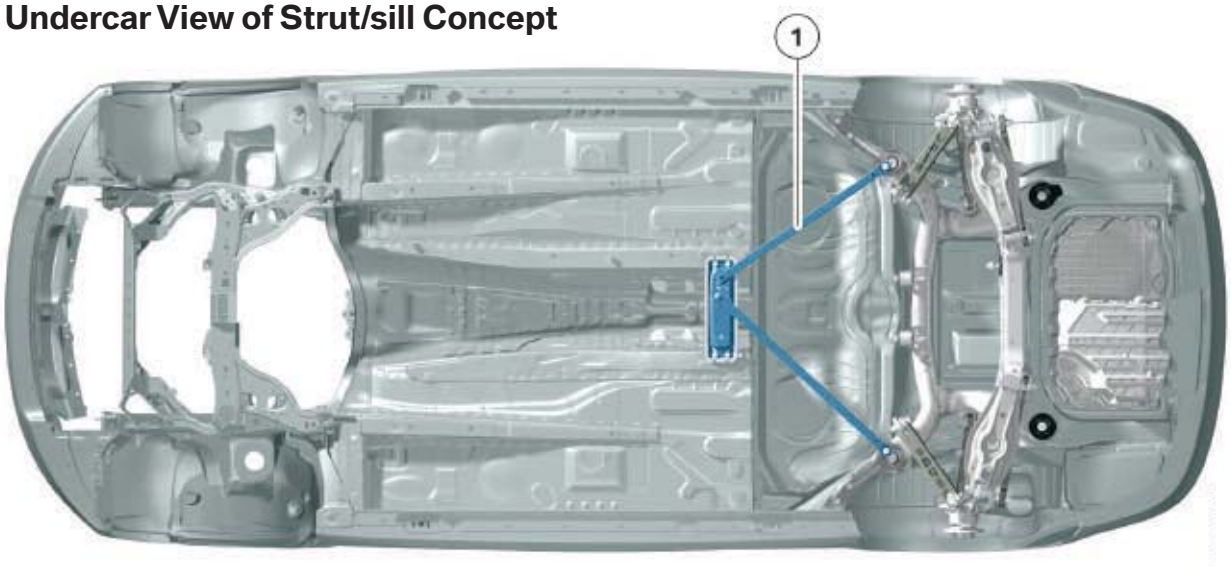
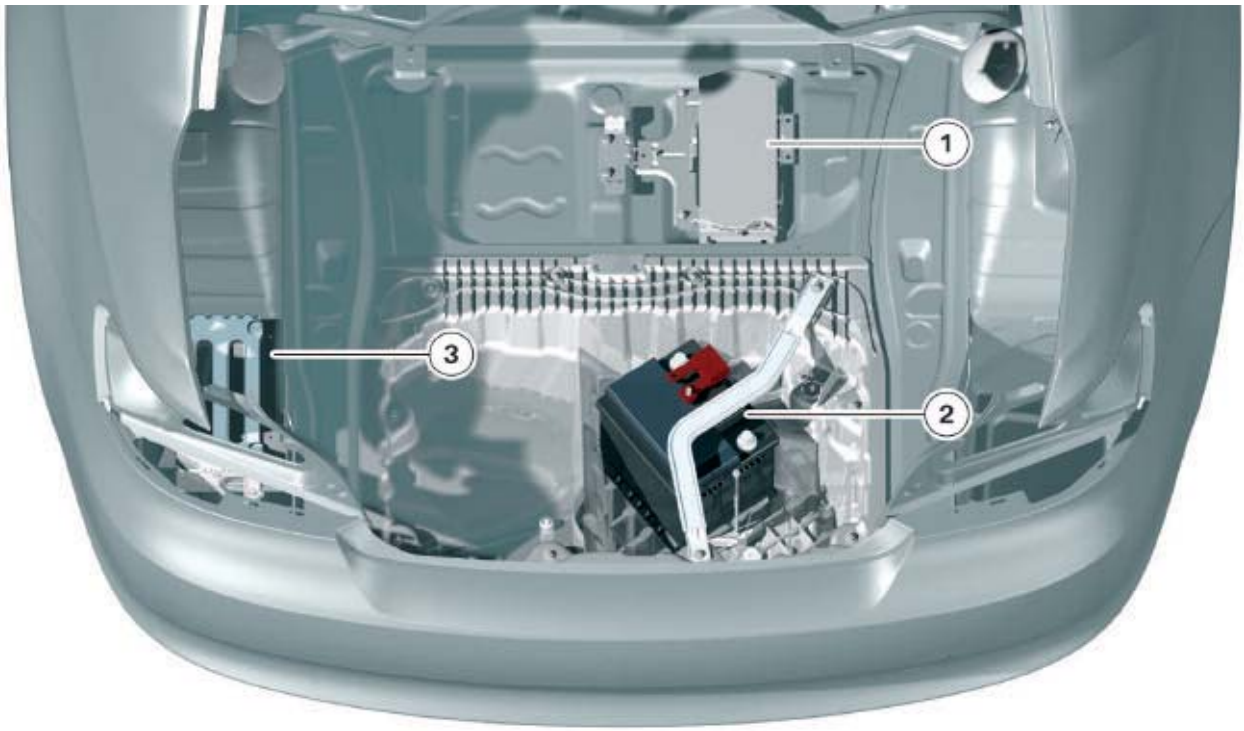
Undercar View of Strut/sill Concept



Index	Explanation
1	1 Tension struts

Layout of Components in Luggage Compartment



Index	Explanation	Index	Explanation
1	TCU	3	CD changer
2	Battery		

Bumpers

In contrast to the E90, the E82 has new bumper trims of different appearance. Energy is dissipated through carriers with deforming elements.

- Fulfillment of Institute for Highway Safety (IIHS) low-speed frontal crash at 10 km/h (6 mph).
- Fulfillment of Institute for Highway Safety (IIHS) low-speed side crash at 5 km/h (3 mph) @ a 15% offset.

The 135i is equipped with a trim weight on the rear bumper. This component contributes to an overall improvement in the overall weight distribution.

Slide/tilt Moonroof

The standard equipment slide/tilt moonroof is constructed in the same way as in the E90. Only the glass panel is slightly different due to the new roof contour. Removal/installation and adjustment are identical to the E90.

Door and Side Panels

The inner door panels are newly designed with an integrated map pocket and a new door opening handle.

Seats

The rear bench seat accommodates two passengers with through-loading system. The rear seat backs fold down flat to enhance cargo space and for easy loading of the luggage compartment.

Chassis Dynamics

Chassis Dynamic Driving Systems

The E82 has many features in common with the E9X as far as the chassis and dynamic driving systems. The double pivot spring strut front axle design of the 3, 5, 7 and 8 Series vehicles will now be used on the 1 Series. With the exception of the 135i sport tuned version the front and rear suspensions are inspired by the E90 design.

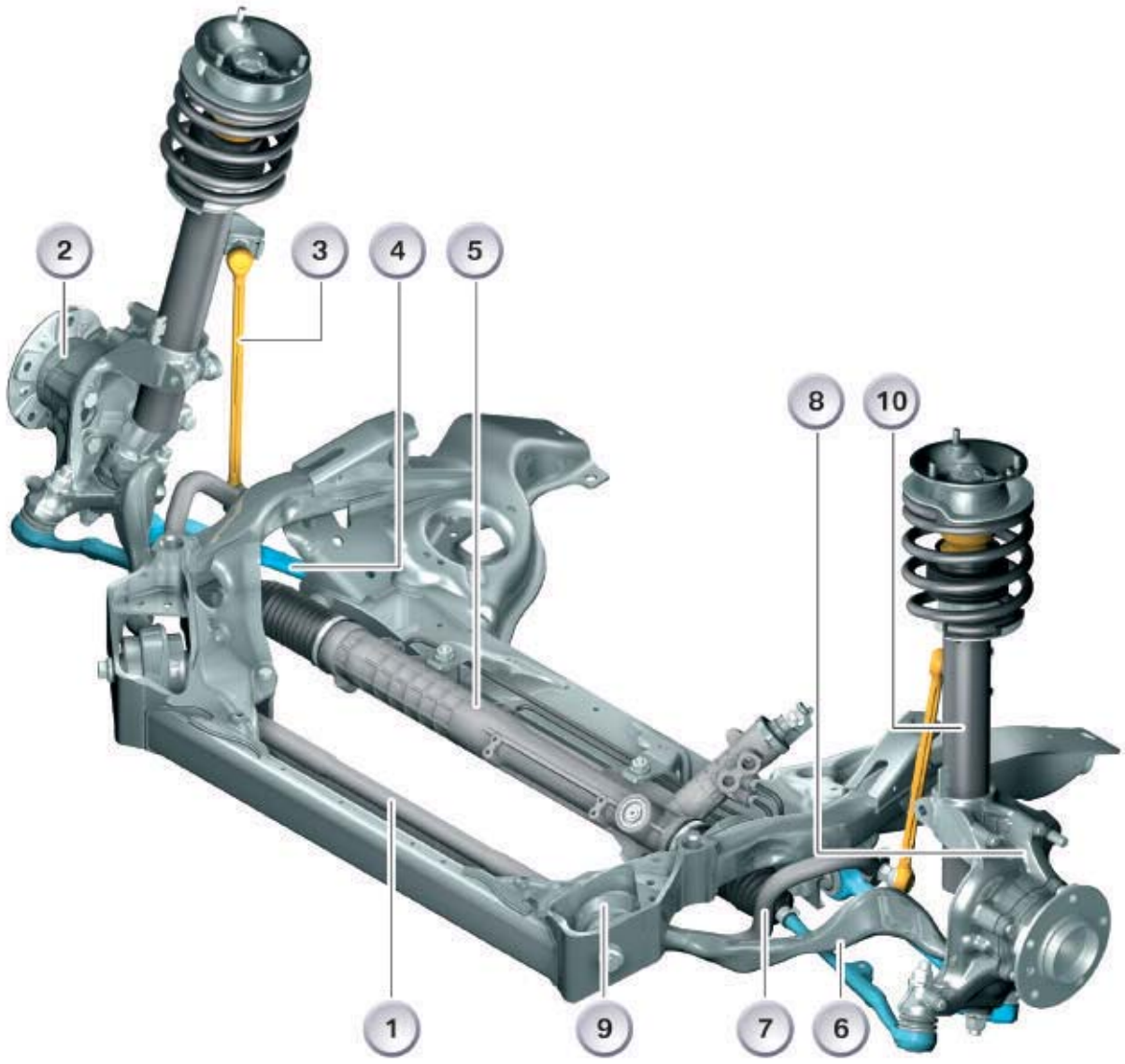
Double Pivot Spring Strut Front Axle

The double pivot system establishes a geometrical “axis” formed by the suspension links, creating one upper and two lower pivot points. Two lower pivot points (double pivot) established by the control arm and tension strut create an “imaginary” pivot point, that is extended further out on the wheel carrier. This design allows pivot points on the wheel carrier to be selected in order to effectively accommodate larger brakes.

Additional advantages of double pivot system are:

- Ability to reduce body roll while cornering.
- Reduces front nose dive tendencies during severe braking situations.
- Utilization of a small positive steering offset, which offers improved handling if friction levels while braking is different on both wheels.
- Enhanced caster position, improves straight line stability at higher speeds, plus better steering return after small steering inputs.

Double pivot spring strut front axle components



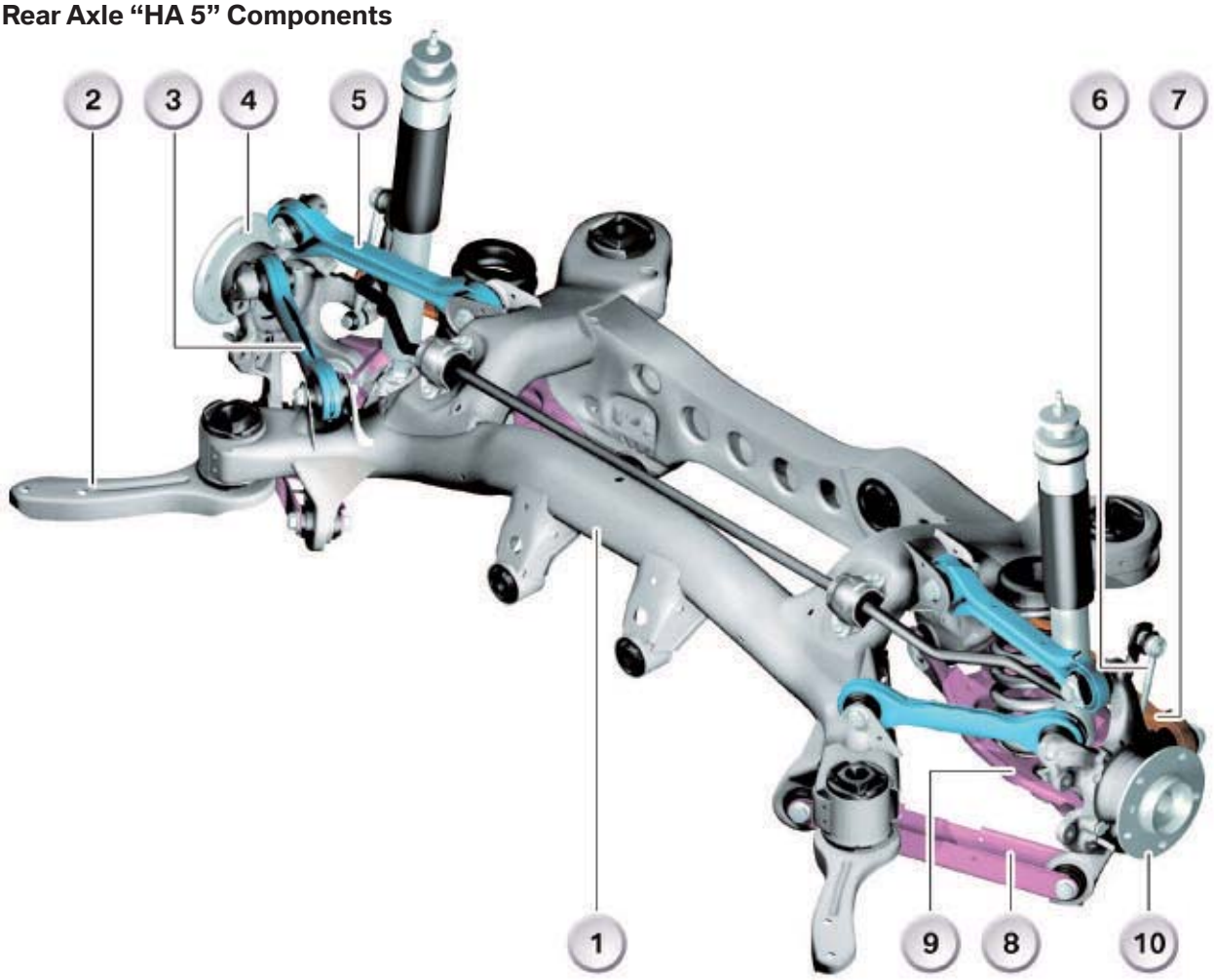
Index	Explanation	Index	Explanation
1	Front Axle Carrier	6	Tension Strut
2	Wheel Hub	7	Stabilizer Bar
3	Stabilizer Link	8	Swivel Bearing
4	Control Arm	9	Hydro-Mount
5	Rack-and-Pinion Steering	10	Spring Strut

Rear Axle "HA 5"

The rear axle on the E82 is of the development designation "HA 5" and was used for the first time on the E90. Currently all E9X vehicles are equipped with a version of this rear axle assembly.

It is designed as a multi-link independent rear suspension axle with 5 different link arms. The designation "HA 5" does not refer to the five links but represents the consecutive development designation used at BMW.

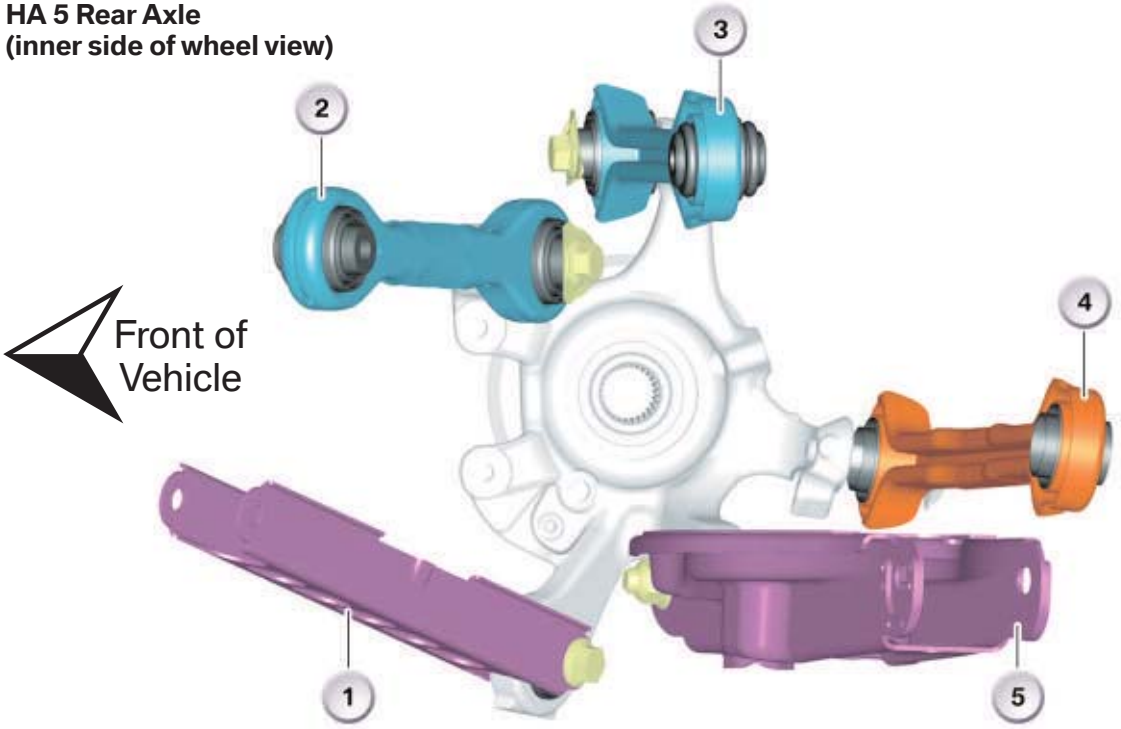
Rear Axle “HA 5” Components



Index	Explanation	Index	Explanation
1	Rear Axle Carrier	6	Stabilizer Link
2	Thrust Rod	7	Toe Link
3	Traction Strut	8	Semi-Trailing Arm
4	Wheel Hub	9	Camber Link
5	Control Arm	10	Wheel Carrier

The use of five links enables free selection of the pivot axle for the design layout. This means that the movement of the wheel interacting with the suspension can be optimized without compromise under braking, acceleration and lateral forces. This mostly determines all important variables such as toe, camber, brake support (anti-dive) angle, roll center and roll center change rate.

HA 5 Rear Axle
(inner side of wheel view)



Index	Explanation	Index	Explanation
1	Semi-Trailing Arm	4	Toe Link
2	Traction Strut	5	Camber Link
3	Control Arm		

The large rear axle carrier is connected directly to the rigid frame side member, allowing it to transmit impact forces more favorably. The semi-trailing arm is a crash collapsible component (in the semi-trailing arm of the HA 5 rear axle) to ensure the fuel tank is not damaged.

The braking support (anti-dive characteristic) on the E82 and on E9X vehicles represents an optimum compromise between comfort, safety and driving dynamics requirements.

The placement of the axle carrier mounting points considerably lower stress and strain on the body with the use of relatively soft rear axle bearing mounts. Together with the double flexible mounting, this provides outstanding insulation against road noise and tire rolling noise.

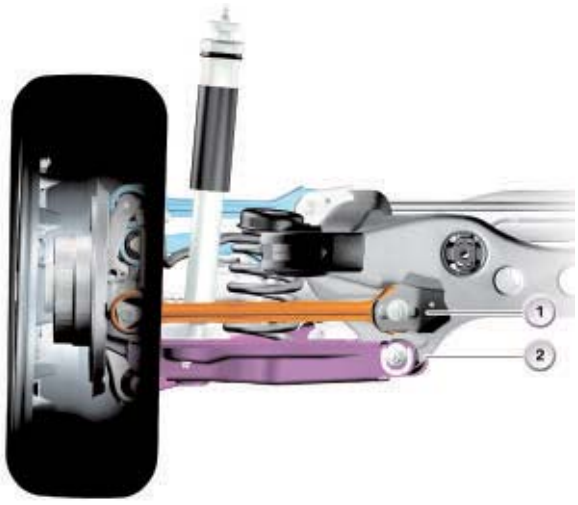
Note: For further information on the 1 Series front or rear suspension refer to the E90 reference material.

The two upper links (blue in the illustration) form a triangle in the top view as do the two lower links (purple in the illustration). The rear link (orange in the illustration) represents the toe rod.

The rear axle carrier and the links are made from high strength steel. The wheel carrier is cast from aluminum alloy.

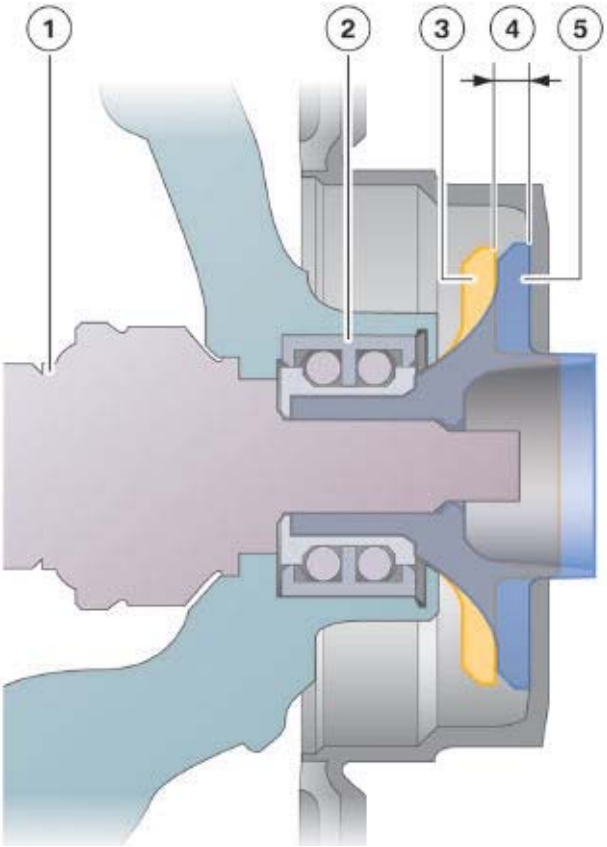
Index	Explanation
1	Toe Adjusting Screw
2	Camber Adjusting Screw

E9X/E82 Rear Axle Adjustments (rear view of left rear)



Minor differences exist between the HA 5 versions being used on the E9X and E82 variants. The rear axle of the E82 is fitted with modified wheel hubs. As a result, the rear track width of the E82 has been widened by 20mm in comparison to the E9X. The extended rear wheel arches, combined with the wider rear track width emphasizes this vehicle's rear-wheel drive characteristics.

Wheel Hub on the Rear Axle, Difference between E82 - E90



Index	Explanation
1	Drive shaft
2	Wheel bearing
3	E90 wheel hub
4	Widening of track width (+10 mm each side)
5	E82 wheel hub

The springs and dampers differ from those in the E90 in that they have been adapted to the E82's vehicle weight. The front axle of the E82 is fitted with a hollow-type anti-roll bar for weight reduction and a sport tuned suspension is available as an option on the 128i (standard equipment on 135i).

The following steering systems are fitted in E82 vehicles:

- Conventional rack-and-pinion steering with Servotronic assist hydraulic pump (vane cell pump) as standard equipment for all 128i and 135i vehicles.
- Active Steering with hydraulic pump and ECO valve is available as an option.

Active Steering in the E82 features the following optimization measures carried over from the E70 or E6x LCI:

- Modified planetary gearing
- New control module
- Absence of the cumulative steering-angle sensor on the rack.

Note: The new procedure for initializing the Active Steering (as in the E70) now also applies to the E82 (because of the absence of the cumulative steering-angle sensor).

Note: There is no electrical steering lock (ELV) for E82 US vehicles, regardless of the transmission type.

Dynamic Driving Systems

The Dynamic Stability Control (DSC) has been newly tuned for the E82, containing the following modifications.

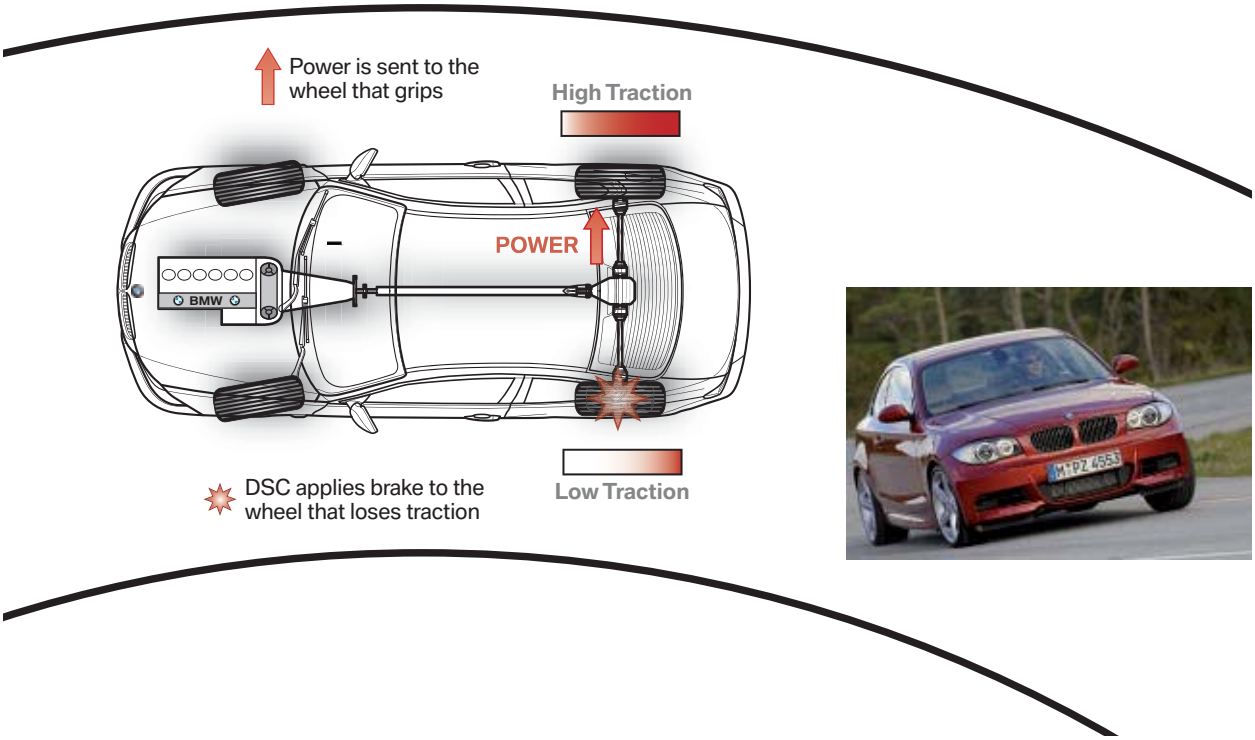
These only apply to the Active Steering models:

- DSC sensor: two separate units, one with and one without a longitudinal acceleration sensor.
- DSC control unit and hydraulic control unit modified.
- Extended diagnostic capabilities due to more precise fault code memory entries.

Note: Vehicles with Active Steering; the operation of the DSC sensor is monitored by both the DSC control unit and the Active Steering control unit.

New DSC Function

At present only the BMW M models are equipped with a mechanical locking differential lock for obtaining optimum traction in extreme driving conditions.



Some experienced drivers occasionally switch the DSC or DTC off, to obtain maximum power and maintain vehicle speed while maneuvering through tight corners. They can complain that without a differential lock too much power is lost through the inner driving wheel which is carrying the smallest part of the load. If it loses grip, the DSC reacts by applying the brakes to regain traction and/or limiting engine torque by shutting off injectors. This results in a loss of power in mid-corner.

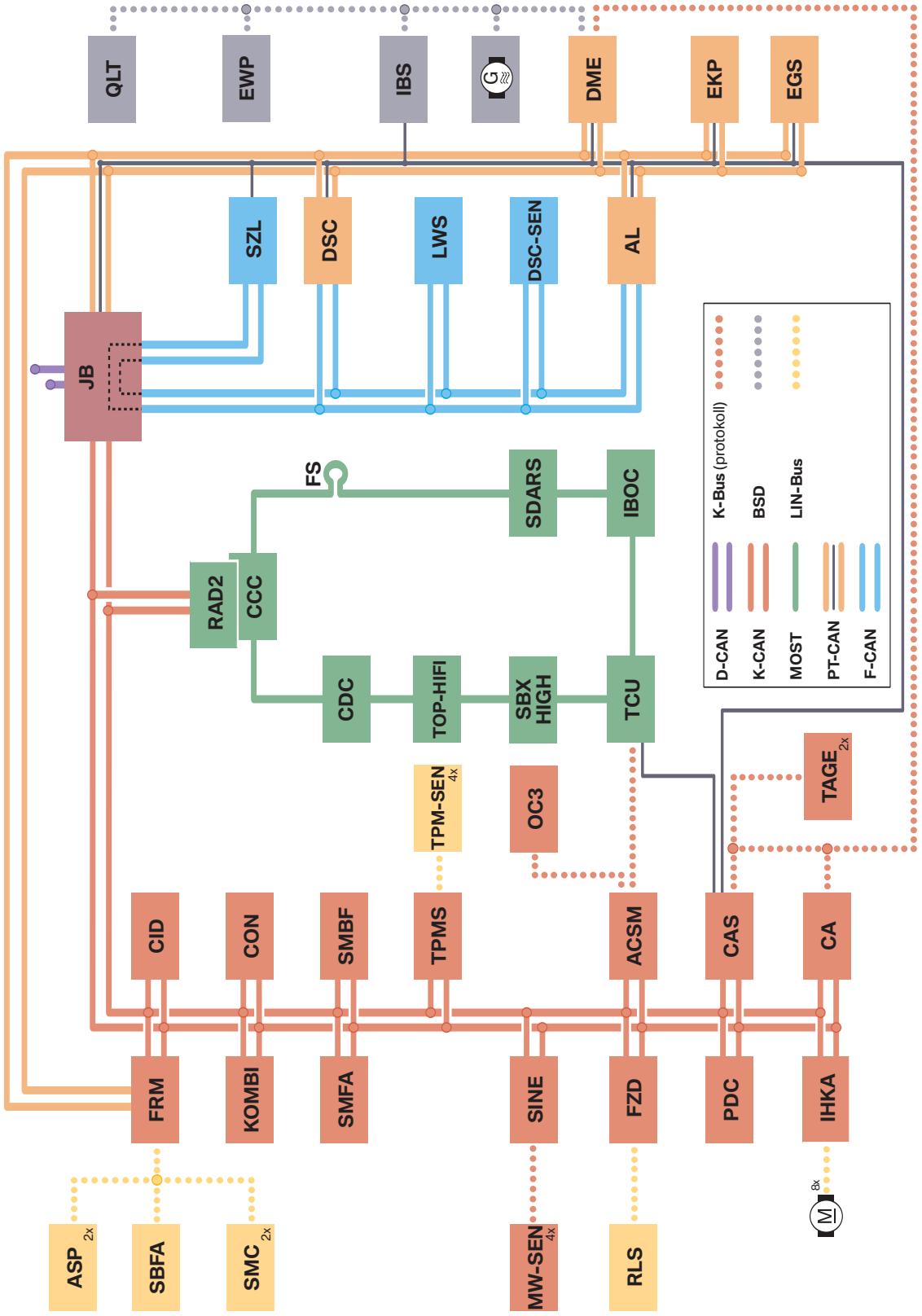
In order to satisfy that demand from performance-oriented drivers, as of March 2008 vehicle production the 135i will be fitted with the new DSC function program that simulates the action of a mechanical limited slip differential. The system uses the typical BMW open type differential, but uses of an electronic intervention program inside the DSC module.

When the vehicle is in tight bend, DSC applies the brakes on the spinning (inside) driving wheel. The torque is then transmitted to the outside wheel which is carrying most of the load, optimizing power and maintaining vehicle speed through the corner. The new function implemented in the DSC control module “simulates” DTC without modulation of engine output. The DSC and DTC functions are unaffected by it.

The advantages of the new DSC program function over a mechanical limited slip differential are:

- It is cost effective.
- It does not add to the vehicle weight.
- Improved fuel economy.
- It activates only when required and if the DSC/DTC is switched off.
- Does not affect handling stability in DSC or DTC mode.
- Avoids the familiar understeer tendency often found with mechanical limited slip differential.

Bus System Overview



E82 Bus System Legend

Index	Explanation	Index	Explanation
AL	Active steering system	KOMBI	Instrument cluster
ASP	Outside mirror	LWS	Steering angle sensor
CA	Comfort access	ACSM	Advanced Crash and Safety Management
CAS	Car access system	OC3	Seat occupancy detection mat
CCC	Car communication computer	PDC	Park distance control
CDC	CD changer	QLT	Quality,level,temp,oil sensor
CID	Central information display	RAD	Radio 2
CON	Controller	RLS	Rain/driving light sensor
DME	Digital motor electronics	SBFA	Driver's door switch cluster
DSC	Dynamic stability control	SDARS	Satellite tuner
DSC-Sen	DSC Sensor	SINE	Emergency current siren w/ tilt alarm sensor
EGS	Electronic transmission control unit	SMBF	Passenger's seat module
EKP	Electric fuel pump control unit	SMC	Stepper motor controller
EWP	Electric water pump	SMFA	Driver's seat module
FRM	Footwell module	Top-HiFi	Top-HiFi Amplifier
FS	Most direct access	TPMS	Tire pressure Monitoring System
FZD	Roof function center	TPM-sen	TPMS Sensors X4
IBOC	In band on channel (digital radio)	SBX -H	Interface box
IBS	Intelligent battery sensor	MW-SEN	Micro wave sensors
IHKA	Automatic climate control	SZL	Steering column switch cluster
TCU	Telematics control unit	TAGE	Electric outer door handle module
JB	Junction box		

Electrical System

The electrical/electronics system of the E82 is identical to that of the E9X.
They are identical in function and have been adopted from all previous models.

- The IHKA is derived from the E9X vehicles and shares its concepts with some differences.
- CAS3 and SBX High are used.
- As stated on the bus chart D-CAN is used as on all current BMW vehicles.

Interface Box (SBX) High

US version will receive a high variant of the interface box, (SBX High) containing the following functions:

- Pairing of customer mobile phone to the vehicle via Bluetooth interface
- Voice-activated control of the telephone or expanded voice-activated control in connection with the Assist/Bluetooth option
- Connection of USB/audio interface for USB storage media.

USB mass storage media that support one of the following standards:

- USB Mass Storage Class
- Apple iPod as of 4th generation.

"USB/Audio interface" consists of the following components:

- Interface Box (SBX) High
- USB hub
- Audio socket with USB interface
- Application software on the head unit.

The USB interface is located on the center console (under the driver's arm rest) and is protected by a slider mechanism.

Note: To prevent charging difficulties, simultaneous use of the USB interface and the 12 V socket for charging the mass storage device is not recommended. Depending on the USB lead used, the mass storage device may be able to be charged through the USB interface. However, the power consumption of the mass storage device must not exceed the maximum level of 500mA permitted by the SBX High.

USB/Audio Interface

It is possible to use USB audio players in the E82 as on, other current BMWs. Connect the USB cable of any device using the USB mass storage protocol thumb drivers and USB mass storage devices that support the "USB Mass Storage Class" standard can be connected. That includes mass storage devices for playback of compressed audio files with a USB interface such as MP3 players, USB memory sticks, etc. The system also supports Apple iPods of the 4th generation or later, iPod nano and iPod mini if connected using the iPod adapter cable (special accessory).

When a USB mass storage device is connected, the contents of the device are read and the folder structure processed for display on the CID. In addition, a plausibility check is performed as to whether the tracks can be played by the vehicle's sound system. Only those tracks that can be played are displayed.

The WAV file (Waveform) format is also supported. USB mass storage devices must be formatted using the FAT (File Allocation Table) file system. If more than one partition (logical drive) has been set up on the device, only the first partition is supported.

The USB mass storage device cannot be accessed if the files are password-protected or are subject to Digital Rights Management (DRM). DRM is a method of protecting copyright and marketing rights relating to intellectual property in digital form. If music tracks acquired from Apple iTunes are to be played, the iPod must be connected by means of an adapter cable that simultaneously uses the jack socket and the USB. The adapter cable comes with the vehicle and is also available from BMW Parts Sales.

Note: The USB Audio interface is located under the driver's armrest on the E82.

With the adapter cable, the USB connection is used to control the iPod and the jack socket for audio playback. The reason for this method of connection is that music tracks obtained from iTunes are subject to DRM and can only be played on the device to which they were downloaded. The copyright protection prevents digital transmission of the music track via USB.

If a video file is selected on the iPod, only the sound track is played. If other supported USB mass storage devices are used, video files are not displayed. It is only possible to access the files on the mass storage device using the iDrive when the USB mass storage device is connected to the USB interface. If the mass storage device is connected using the jack plug, the iDrive cannot be used to operate the device.

The Y cable is supplied with the vehicle and also may be ordered through BMW Parts Sales.

A convenient media player holder is located under the arm rest.

Note: For more information on the USB Audio interface refer to the March 07 Updates reference information.

Special Features

Special Features of the 135i

The top model of the E82, the 135i, has the following special features pertaining to chassis and dynamic driving systems:

- Xenon Adaptive Headlights with auto-leveling, and Cornering Lights are standard equipment.
- Sports suspension is standard equipment.
- 18" mixed tires available as an option. These tires provide superb grip on dry as well as wet road surfaces. This results in outstanding handling characteristics that underline the sporty nature of this model. (17'' tires are standard equipment)
- The high-performance brake system of the 135i has 338mm front brake discs and 324mm rear discs. Six piston, fixed type aluminum calipers are used on the front while two pistons are used on the rear. These contrast with the standard cast-iron, floating-type calipers fitted to128i models.
- New DSC program function where brake intervention at either drive wheel has the effect of improving the dynamic acceleration out of corners, even with DSC switched off. The accelerator pedal has a quicker response rate and electronic rear brake management is used to simulate a mechanical limited slip differential for enhanced acceleration out of turns.